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WINDS OF THE *United States*.

By PLINY EARLE CHASE.

*(Read before the American Philosophical Society, March 17, 1871.)*

Notwithstanding Ferrel's mathematical, and Galton's practical, demonstration of the tendency, in winds of propulsion, to become anti-cyclonic, many meteorologists regard cyclonic atmospheric currents as normal, in fair as well as in stormy weather. Such an impression may be naturally strengthened by the admitted facts, that most of the European winds are cyclonic, that all currents flowing in towards a centre of low pressure, speedily become cyclonic, and that the system of aspiration induced by the diminished pressure at the equator, is the proximate cause of all our atmospheric circulation.

But it should be remembered on the other hand, that the normal motion of the principal oceanic, atmospheric and magnetic currents, both polar and equatorial, and the daily veering of the wind consequent on the progressive heating of the earth's surface, are confessedly anti-cyclonic; that centres of violent and rapid commotion must necessarily cover a smaller area than the less disturbed peripheries which help to restore the equilibrium; that the air drifts more often in alternate ridges and troughs than in spirals; and that downward pressure is the impelling force by which the partial vacua, produced by increase of temperature or by condensation of vapor, are supplied. Each of these considerations is indicative of systems of winds over the entire globe, which are normally anti-cyclonic, and only exceptionally cyclonic. Even in storms, the blending of opposite currents may take place at a circumference as well as at a centre, and condensation of vapor may be going on along an extended line, the equilibrium being restored by the pressure of an adjacent ridge, as well as over a limited area towards which there is an influx from all quarters. There may, therefore, be anti-cyclonic as well as cyclonic storms. In fact, as I stated at the last meeting of the Society, most of our recent storms have been of the former character, and the more closely I have scrutinized the Signal Service observations, the more strongly have I been impressed with the belief that most, if not all, of our north-easterly storms are anti-cyclonic as a whole, though they may be accompanied by limited and comparatively insignificant local cyclones, and although, in consequence of the trend of our Atlantic coast and the in-draught towards the gulf stream, they may assume a form more or less cyclonic as they leave our shores.

The charts in Coffin's *Winds of the Northern Hemisphere*, seem to me to furnish ample confirmation to these views, although, in consequence of their very admirable fulness of detail, general tendencies are sometimes disguised by the local deflecting influences of mountains, lakes and valleys. In order to eliminate such local disturbances, I have grouped by States and Territories, all the winds in the first volume of the "*Results of Meteorological Observations*," from 1854 to 1859 inclusive, and computed the resultant for the entire period for each district.

## I. Number of Winds from each cardinal point.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
British America.....	1651	3599	853	2645	2098	4735	3055	4932
Maine.....	2008	4331	1198	2664	2248	6349	3324	8342
New Hampshire.....	860	1464	1234	1607	933	2652	3057	4641
Vermont.....	3585	761	401	1150	6225	2018	1976	4040
Massachusetts.....	3681	7158	2619	6068	3802	13656	8020	18095
Rhode Island.....	133	518	73	120	241	720	199	1114
Connecticut.....	1560	2636	675	1569	1842	4352	1498	5940
New York.....	4639	6581	3692	6582	8676	14314	14882	13342
New Jersey.....	1016	2599	658	1423	1056	4158	2377	3989
Pennsylvania.....	4556	6399	6743	6848	6398	13617	17346	16930
Delaware.....	39	147	59	90	42	164	97	316
Maryland & D. of C.....	1650	2849	1082	1674	2621	3812	4410	3870
Virginia.....	3725	3230	1759	1790	4590	5616	3400	4319
North Carolina.....	1019	1760	470	512	809	2019	2080	1122
South Carolina.....	1248	3252	1036	2026	1505	3989	1616	2306
Georgia.....	1585	3436	2052	2595	2415	3240	2611	4118
Florida.....	2374	6455	2651	3831	1411	4265	1801	3441
Alabama.....	676	508	548	1307	734	859	897	1096
Mississippi.....	923	929	738	1211	971	1253	812	1447
Louisiana.....	736	969	194	1040	793	782	134	659
Texas.....	4357	1011	1168	2966	5871	1510	1009	1181
Tennessee.....	567	649	316	884	980	755	393	715
Kentucky.....	604	1343	447	762	1218	3159	1453	1650
Ohio.....	3151	5277	1976	6509	4742	14747	7449	9828
Michigan.....	2079	3508	2776	3427	3061	7300	6170	5608
Indiana.....	1449	1086	990	1853	1910	2901	2591	2418
Illinois.....	3510	7151	3593	6963	8026	11218	8063	9126
Missouri.....	531	492	678	1195	906	838	1081	710
Wisconsin.....	3321	4932	2689	4073	4150	6967	5374	5906
Iowa.....	2249	3144	1636	5370	3648	5891	3063	7374
Minnesota.....	915	753	910	782	1469	710	1209	2033
Nebraska.....	1035	436	235	598	1226	434	287	717
Kansas.....	984	491	360	757	1371	559	182	586
Mexico.....	172	345	73	59	68	144	85	123
California.....	985	235	185	904	1272	1175	979	904
Bahamas.....	163	348	252	292	217	418	200	182
Guatemala.....	56	806	18	16	3	262	6	52
Surinam.....	89	803	417	427	141	39	5	19

## II. Percentages, and Resultant Winds.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Resultant.
British America.....	7	15	4	11	9	20	13	21	N. 85° 28' W.
Maine.....	7	14	4	9	7	21	11	27	" 72 47 "
New Hampshire.....	5	9	7	10	6	16	19	28	" 75 39 "
Vermont.....	17	4	2	6	31	10	13	20	S. 71 46 "
Massachusetts.....	6	11	4	9	6	22	13	29	N. 78 26 "
Rhode Island.....	4	17	2	4	8	23	6	36	" 65 4 "
Connecticut.....	8	13	3	8	9	22	7	30	" 72 43 "
New York.....	6	9	5	9	12	20	21	18	S. 77 34 "
New Jersey.....	6	15	4	8	6	24	14	23	N. 81 45 "
Pennsylvania.....	6	8	9	9	8	17	22	21	" 89 20 "
Delaware.....	4	16	6	9	5	17	10	33	" 55 23 "
Maryland & D. of C.....	7	13	5	8	12	17	20	18	S. 88 59 "
Virginia.....	13	12	6	6	16	20	12	15	" 81 31 "
North Carolina.....	10	18	5	5	8	21	21	12	N. 78 22 "
South Carolina.....	7	19	6	12	9	23	10	14	S. 65 57 "
Georgia.....	7	15	9	12	11	15	12	19	N. 74 59 "

Florida.....	9	25	10	15	5	16	7	13	N 50 7 E.
Alabama.....	10	8	8	20	11	13	14	16	S. 44 25 W
Mississippi.....	11	11	9	15	12	15	10	17	" 76 48 "
Louisiana.....	14	18	4	20	15	15	2	12	" 67 10 E.
Texas.....	23	5	6	16	31	8	5	6	" 13 28 "
Tennessee.....	11	12	6	17	19	14	7	14	" 8 57 W.
Kentucky.....	6	13	4	7	11	30	14	15	" 67 53 "
Ohio.....	6	10	4	12	9	27	14	18	" 67 45 "
Michigan.....	6	10	8	10	9	22	18	17	" 74 26 "
Indiana.....	9	7	7	12	13	19	17	16	" 67 40 "
Illinois.....	6	12	6	12	14	20	14	16	" 52 18 "
Missouri.....	8	8	10	19	14	13	17	11	" 17 34 "
Wisconsin.....	9	13	7	11	11	19	14	16	" 79 50 "
Iowa.....	7	10	5	17	11	18	9	23	" 68 6 "
Minnesota.....	10	9	10	9	17	8	14	23	N. 82 39 "
Nebraska.....	21	9	5	12	25	8	6	14	S. 50 4 "
Kansas.....	19	9	7	14	26	11	3	11	" 24 18 E.
Mexico.....	16	32	7	6	6	13	8	12	N. 16 15 "
California.....	15	3	3	14	19	18	15	13	S. 56 53 W.
Bahamas.....	8	17	12	14	10	20	10	9	" 23 53 E.
Guatemala.....	5	66	2	1	0	21	1	4	N. 43 17 "
Surinam.....	5	41	22	22	7	2	0	1	" 80 53 "

This grouping, by exhibiting the excess or deficiency, in the percentage of any given wind, from the percentage of the same wind in adjacent districts, shows local irregularities which are often easily explicable by the physical features of the neighborhood, and enables us, by plotting the general resultants on a map, to demonstrate the anti-cyclonic motion of the air, over the entire region between the twenty-fifth and forty-fifth parallel of latitude, and between Passamaquoddy Bay on the east, and the 100th meridian on the west. It shows, moreover, that there is a normal intersection of a polar (N. E.) current off the coast of Florida, with an equatorial (S. W.) current from the Bahama Islands, and a similar intersection of a south-easterly and south-westerly equatorial current, (the latter having been refrigerated by the Sierra Nevada,) near the common boundary line of Nebraska and Kansas. The former of these intersections is analogous to the one referred to by Mr. Scott, as indicative of an approaching gale in the British Islands, and suggests an obvious explanation of the gulf stream cyclones, as well as of the cyclonic winds in Western Europe; the latter helps to account for a considerable proportion of our land storms.

The comparison of these currents and intersections with Blodget's hyetal charts is very instructive, and I feel little hesitation in predicting that a more thorough acquaintance with the winds of Alaska and British America, will develop another anti-cyclonic system, referable to a different centre of disturbance, with intersecting normals near the northern boundary line between the polar and equatorial prevailing winds, and perhaps in the valley of the Saskatchewan, which has been specially designated by Professor Henry as a storm-breeding district.